SIMPLIFIED PROCEDURES FOR OBTAINING CLEARANCES OF FOODS PRESERVED BY IONIZING ENERGY

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Abstract — Résumé — Аннотация — Resumen

SIMPLIFIED PROCEDURES FOR OBTAINING CLEARANCES OF FOODS PRESERVED BY IONIZING ENERGY. After thirteen years of intensive research, using high doses of ionizing energy, highly acceptable wholesome shelf-stable bacon, ham, pork, beef, chicken and shrimp can be produced in the laboratory. Using doses below 1 Mrad, the shelf life of highly acceptable wholesome fish, wheat and wheat products, oranges, and white potatoes can be extended. Before production in the United States can be scaled up to commercial quantities for the broad consumer market, approvals are required from the United States Food and Drug Administration (USFDA) and, for meats from mammals and birds, from the United States Department of Agriculture (USDA). These agencies have approved bacon, wheat and wheat products, and white potatoes, following receipt and evaluation of petitions containing all pertinent information including description of the process to be used and the food-package combination to be cleared, the proposed radiation source, the dose range, dosimetry methods, wholesomeness and nutritional data, positive proof of microbiological safety, absence of measurable induced radioactivity, acceptance data from taste panelists, and storage and shipping data where applicable.

Collecting the data required for successful petitions has proved to be both time-consuming and expensive. To improve this situation, the whole process of data collection and of writing the petitions is being re-examined in the interest of streamlining and expediting the process. Recommendations are offered relative to some of the means helpful in achieving this end.

PROCEDURES SIMPLIFIEES POUR OBTENIR L'AUTORISATION DE PRODUIRE DES DENREES ALIMENTAIRES CONSERVEES PAR LES RAYONNEMENTS IONISANTS. Après treize ans de recherches intensives au moyen de fortes doses de rayonnements ionisants, il est maintenant possible de produire en laboratoire des denrées – lard, jambon, viande de porc et de bœuf, poulet, crevettes – se conservant bien et de comestibilité tout à fait satisfaisante. En utilisant des doses inférieures à 1 Mrad, il est possible de prolonger la durée de conservation du poisson, du blé et dérivés, des oranges et des pommes de terre à chair blanche, la comestibilité de ces denrées étant tout à fait satisfaisante. Aux Etats-Unis, pour développer la production de ces denrées dans des proportions suffisantes pour alimenter le marché, il est nécessaire d'obtenir l'autorisation du Service de contrôle des produits alimentaires et pharmaceutiques et, pour les viandes de mammifères et de volatiles, celle du Département de l'agriculture. Ces institutions ont approuvé la mise sur le marché de lard, de blé et dérivés et de pommes de terre à chair blanche, après réception et examen de demandes contenant tous les renseignements pertinents, notamment la description du procédé d'irradiation et de conditionnement à faire accepter, la source de rayonnements proposée, la dose, les méthodes de dosimétrie, les données relatives à la comestibilité et à la valeur nutritive, la preuve positive de l'innocuité microbiologique, l'absence de radioactivité induite mesurable, le certificat d'acceptation d'un groupe de dégustateurs et, s'il y a lieu, les données relatives à l'emmagasinage et à l'expédition.

Le rassemblement des données nécessaires aux demandes d'autorisation s'est révélé à l'usage long et coûteux. Pour remédier à cet inconvénient, on étudie actuellement les moyens de simplifier et d'accélérer le rassemblement des données et la rédaction des demandes. L'auteur présente des recommandations touchant certaines des méthodes qui permettraient d'arriver à ce résultat.

УПРОЩЕННАЯ ПРОЦЕДУРА ПОЛУЧЕНИЯ РАЗРЕШЕНИЙ НА ПРОДАЖУ ОБЛУЧЕННЫ ПИЩЕВЫХ ПРОДУКТОВ. После тринадцати лет интенсивных исследований с применением больших доз ионизирующей энергии в настоящее время в лаборатории можно получить следующие продукты высокого качества, не портящиеся при длительных сроках хранения: бекон, ветчину, свинину, куры и креветки. Используя дозы меньше 1 Мрад, можно значительно увеличить сроки хранения таких продуктов, как рыба, пшеница, мучные продукты, апельсины и белый картофель без ущерба для их качества и пригодности употребления в пищу. Для

того, чтобы начать производство таких облученных продуктов в США в широких коммерческ масштабах потребуются специальные разрешения от Управления по пищевым продуктам и медикаментам США, а в случае мяса млекопитающихся и птиц – от Министерства сельского хозяйства США. Эти учреждения уже разрешили продажу облученного бекона, пшеницы, мучных продуктов и белого картофеля после получения и рассмотрения ходатайств, содержащих все необходимые сведения, включая описание процесса обработки, тары и упаковки, предлагаемый источник излучения, диапазон доз, методы дозиметрии, данные о пригодности употребления в пищу и о содержании питательных веществ, доказательства микробиологической безопасности, отсутствие заметной наведенной радиоактивности, утверждение дегустаторами, а также, в случае необходимости, данные по хранению и транспортировке.

Сбор подобных данных, необходимых для принятия ходатайства, требует длительного времени и больших затрат. В целях облегчения и ускорения этой работы пересматривается весь процесс сбора данных и составления ходатайств. Даются соответствующие рекомендаци

SIMPLIFICACION DE LOS PROCEDIMIENTOS PARA LA OBTENCION DE AUTORIZACIONES DE VENTA DE ALIMENTOS CONSERVADOS MEDIANTE RADIACIONES IONIZANTES. Después de trece años de investigaciones intensivas con aplicación de elevadas dosis de radiaciones ionizantes se ha logrado prolongar considerablemente en laboratorio el período de conservación de productos tales como el tocino, el jamón, la carne de cerdo, la carne de vaca, los pollos y los mariscos, sin que pierdan su comestibilidad. Aplicando dosis inferiores a 1 Mrad puede prolongarse el período de conservación del pescado, del trigo y sus derivados, de las naranjas y de las patatas blancas en condiciones de comestibilidad plenamente satisfactorias. En los Estados Unidos, antes de pasar a la producción en escala comercial para lanzar el producto al mercado, es preciso obtener la aprobación de la United States Food and Drug Administration (USFDA) y, en lo que se refiere a las carnes de mamíferos y de aves, del United States Department of Agriculture (USDA). Estos organismos han dado su aprobación para productos como el tocino, el trigo y sus derivados, y las patatas blancas, después de recibir y examinar peticiones acompañadas de toda la información pertinente: procedimiento que se aplicará, descripción del conjunto alimento-envase objeto de la petición, fuente radiactiva que se va a emplear, orden de magnitud de la dosis, métodos de dosimetría, datos sobre comestibilidad y valor nutritivo, pruebas positivas de seguridad microbiológica, ausencia de radiactividad inducida detectable, datos de aceptación obtenidos por grupos de catadores y, cuando proceda, datos referentes al almacenamiento y transporte.

La reunión de todos los datos necesarios para que se apruebe la petición exige mucho tiempo y resulta costosa. Para remediar esta situación se está revisando todo el proceso de acopio de datos y de presentación de peticiones a fin de hacerlo más expedito. En la memoria formulan sugerencias sobre los medios más apropiados para lograr este fin.

After fourteen years of intensive research using high doses of ionizing energy, highly acceptable, wholesome, shelf stable bacon, ham, pork, beef, chicken, and shrimp can be produced in the laboratory (1). By using doses below 1 megarad, the storage life of highly acceptable, wholesome onions (2), fish (3), wheat and wheat products (4), white potatoes (5), strawberries (6), and other fruits and vegetables can be extended (2). Before production in the United States can be scaled up to commercial quantities for the broad consumer market, approvals are required by the U. S. Food and Drug Administration (FDA) and, in addition, for meats and meat products from cattle, sheep, swine, goats, horses, reindeer, poultry and domestic rabbits, by the U. S. Department of Agriculture (USDA).

Although considerable reliance for maintaining high safety and sanitary standards for foods is placed upon voluntary self-policing by the food processing industry, U. S. Government control of foods processed by ionizing energy is based upon the following three statutes:

1. The Federal Food, Drug and Cosmetic Act, administered by FDA of the U. S. Department of Health, Education and Welfare (HEW). This act applies to all food products entering into interstate commerce including those derived from wild animals, fish, and game (7). The

Food Additives Amendment of 1958 to the Federal Food, Drug, and Cosmetic Act (8) "includes regulation of any source of radiation intended for treatment of foods and deems intentionally irradiated foods to be adulterated unless such use of radiation has been cleared for safety by regulation or unless an exemption has been granted for research purposes." Specifically, the amendment to the law defines "food additives" to mean " * * * any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food (including any substance intended for use in production, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food; and including any source of radiation intended for any such use) * * * "

The statute sets up procedures for petitioning FDA to issue regulations permitting under specified conditions the use of food additives such as ionizing energy. Title 21, U. S. Code Section 348 states: "(b) (1) Any person may, with respect to any intended use of a food additive, file with the Secretary (of HEW) a petition proposing the issuance of a regulation prescribing the conditions under which such an additive may be safely used. (2) Such petition shall, in addition to any exploratory or supporting data, contain:

"A. The name and all pertinent information concerning such food additive, including where available its chemical identity and composition;

"B. A statement of the conditions of the proposed use of such additive, including all directions, recommendations and suggestions proposed for the use of such additive, and including specimens of its proposed labeling;

"C. All relevant data bearing on the physical or the technical effect such additive is intended to produce, and the quantity of such additive required to produce such effect;

"D. A description of practicable methods for determining the quantity of such additive in or on food, and any substance formed in or on food, because of its use; and

"E. Full reports of investigations made with respect to the safety for use of such additive, including full information as to the methods and controls used in conducting such investigations."

The data in the petition should serve as convincing evidence that the food treated with ionizing energy is safe for human consumption, the desired effect of radiation is accomplished, the irradiation dose used is not higher than reasonably needed, no measurable induced radioactivity (above background level) is present in the food when it enters distribution channels, and the process is safe and efficacious under reasonably simulated commercial conditions without significant deleterious effects in flavor, odor, texture, or appearance of the product.

2. The Federal Meat Inspection Act (9), administered by the Consumer and Marketing Service, USDA, is "for the purpose of preventing the use in interstate or foreign commerce ..... of meat and meat food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food .....". The statute applies to cattle, sheep, swine and goats and edible products derived from them. The USDA's responsi-

bility begins with approval of plans to construct a new meat processing plant or remodelling an existing plant. The USDA inspectors supervise each stage of meat processing from the live animals in holding pens to the finished product. If ionizing energy is contemplated in processing meats for interstate or foreign commerce, its use must be approved by USDA. The list of animals covered in the basic statute has been extended by the Horse Meat Act of 1919 to horses and the Agricultural Marketing Act of 1946 to reindeer. Based upon requests sufficiently supported by scientific back-up data, the USDA will issue regulations approving the use of ionizing energy for meat processing. The evidence contained in the request for approvals must include data pertaining to wholesomeness, microbiological safety, absence of toxicity, nutritional adequacy, control of the processing, labeling and benefits.

3. Poultry Products Inspection Act of 1957, administered by the Consumer and Marketing Service of USDA "requires inspection for wholesomeness of all poultry processed at plants shipping any of their product in interstate or foreign commerce" (10). Poultry is defined in the Poultry Products Inspection Act of 1957 as "any live or slaughtered domesticated bird", including, but not being limited to chickens, turkeys, ducks, geese and guineas. The USDA is also responsible for inspection and grading of shell eggs, egg products and domestic rabbits (11). Use of ionizing energy in processing plants coming under the jurisdiction of the Poultry Products Inspection Act is permitted through issuance of regulations by USDA. The authority of USDA extends to the approval of floor plans for the processing plant, suspension of operations if alterations of buildings, facilities, and equipment have not been approved and to control of all operations and procedures involved in preparation, storage, or handling of any product to assure conformity to standards of cleanliness and sanitation. Labeling approved by USDA is also required for poultry products which have been treated with compounds to retard spoilage (12).

It is apparent that the petitioner has a formidable task in satisfying the many stringent requirements written into the statutes to obtain approval of the use of ionizing energy for preserving foods. Yet the task is not insuperable as attested by the fact that ionizing energy has been approved in the Soviet Union, Canada and the United States to inhibit sprouting of white potatoes, in Canada to inhibit sprouting of onions, and in the United States to deinfest wheat and wheat products and to produce shelf stable canned bacon.

It can be argued on purely scientific grounds that the use of ionizing energy to preserve food requires no special legislation. The reality of the situation is that a considerable segment of the population -- call it public opinion -- supports such legislation, and would effectively oppose eliminating such statutes from the books. Raising such a controversial issue could make the public apprehensive when it hears conflicting views expressed in testimony by the experts. The result of this controversy could adversely affect the market for irradiated foods. Instead of fighting the problem, the recommended approach is to complete the collection of the scientific evidence in support of petitions to clear a wide variety of foods. As more and more foods processed by ionizing energy receive approval, fewer and fewer foods will remain banned by the specialized legislation. Ultimately, no major foods or classes of foods amenable to preservation by ionizing energy will remain restricted under the special legislation. Also, as commercial experience with the processing of foods by ionizing energy becomes more and more widespread, the confidence of consumers, legis-

lators, and regulatory agencies in the safety and efficacy of the process will make it simpler to obtain clearances for additional foods.

How can the petitioning process be simplified and streamlined? In those countries where legislation pertaining to foods preserved by ionizing energy is not yet on the books, it is recommended that authority be vested in a single agency to administer laws on this subject. This defines clearly for the petitioner where the authority lies and minimizes the time, effort, and possible confusion if he is required to deal with several independent governmental agencies. I hasten to add that in the United States petitioners such as the Army, after some trial and error, have finally learned how to cope with the dual responsibility of FDA and USDA. We have ascertained that the supporting data required by these agencies is essentially the same since both have the same objective to protect the consumer. Therefore, in the case of future requests for clearances, we will submit the same petition to both agencies.

Since the data embodied in petitions requires years of research and significant expenditure in money and manpower, it is recommended that the regulatory agency establish as clearly as possible at the outset reasonable requirements for the breadth and depth of the scientific data it will require in petitions. This may be difficult to achieve initially when there is no precedent and where the irradiation process is so new that there is little in the way of prior experience to serve as guidance. In the United States, FDA at the request of the Army and Atomic Energy Commission has set general guidelines for animal feeding experiments to determine wholesomeness, for inoculated pack studies to determine microbiological safety, and for extractive studies to assess the suitability of flexible packaging. These guidelines serve as the basis for preparing detailed experimental protocols which in many instances, particularly with inoculated pack studies, are coordinated informally with responsible officials of FDA and USDA before commencing research. In this way the petitioner is able to see a finite end to the research needed to attain his objectives and can allocate his money, personnel, and time accordingly. FDA approved guidelines and research protocols used in the Army's program can be made available to the International Atomic Energy Agency/Food and Agriculture Organization of the United Nations (IAEA/FAO) for distribution to regulatory bodies of member countries.

Since the application of ionizing energy to preserve foods is still in its infancy, it is recommended that government regulating bodies adopt a flexible attitude toward their requirements for data in petitions as circumstances change. This flexibility can work either in the direction of tightening or loosening requirements. For example, if a food or packaging material can be cleared, the regulating agency could require fewer supporting data for a closely related food or material, or waive requirements altogether for further testing and grant a blanket clearance by class. On the other hand, if unexplained anomalies occur, the regulating agency may require more exhaustive testing than originally anticipated. Only under extenuating circumstances should regulating agencies change requirements or impose new ones in midstream.

Upon request the regulating agency should be willing to advise the petitioner during the process of data gathering. During the years of laborious accumulation of data, common sense or good judgment may lead the petitioner to modify his experimental protocols, or give greater or lesser emphasis to one or more facets of his research effort. He could also encounter seemingly insurmountable roadblocks; objectives may

change as circumstances change. In such cases, the regulatory agency should be amenable to giving advice informally to the petitioner. This advice could materially foreshorten the data gathering cycle. As a corollary to assistance during the data gathering cycle, the regulating agency should also be willing, upon request, to advise the petitioner in the preparation of the petition. In the United States, officials of FDA and USDA have always responded willingly and given unstintingly of their time to requests by the Army for advice and guidance during the period of data gathering and petition preparation.

The U. S. Army Medical Service has completed animal feeding studies on 21 foods representing the major food classes consumed in the United States. As a result of these monumental studies begun in 1955, the Army Medical Service has concluded that "foods irradiated up to absorbed doses of 5.6 megarads with a cobalt 60 source of gamma radiation or with electrons with energies up to 10 million electron volts have been found to be wholesome; i.e. safe, and nutritionally adequate (13)." The U. S. Atomic Energy Commission's animal feeding studies on fish, shellfish, fruits and vegetables have not uncovered a single deleterious finding in any animal which can be attributed to consumption of a food preserved with ionizing energy (14). As far as can be foreseen at present, there will be only minimal needs in the future for further wholesomeness testing by the Army (15). Because of the overwhelming cumulative evidence from animal feeding studies on the wholesomeness of foods treated with ionizing energy it is recommended that, except for irradiating fresh fruits and vegetables prior to maturation (e.g. bananas), regulating agencies require only absolutely essential additional feeding experiments. An annotated bibliography of all the previous feeding studies has been published (16).

The question of standards of safety from a microbiological standpoint of foods preserved by ionizing energy is still unresolved. Where the objective is to achieve shelf stable food products, the organism of primary concern is Clostridium botulinum. For want of a better standard, we use the 12-D concept - to reduce a Clostridium botulinum spore population by a factor of 10 to the 12th power (10^{12}). As knowledge increases on the natural occurrence of botulinal organisms in raw foods, and their susceptibility to irradiation, it may be possible to modify this standard. To this end, a special task group has been formed under the auspices of the National Academy of Sciences -- National Research Council (NAS-NRC) to recommend standards for microbiological safety for foods made shelf stable by ionizing energy. It is recommended that IAEA/FAO serve as a focal point for compilation of world-wide data of the natural occurrence of Clostridium botulinum in raw foods, and its susceptibility to irradiation. These data will serve as valuable inputs to the study under way by the NAS-NRC task group and could streamline the effort and reduce costs in experiments to determine the minimum required radiation doses for individual shelf stable foods.

The petition cycle can be simplified and shortened if regulating agencies establish timetables to which they will adhere for review of petitions and rendering decisions. In the United States, FDA's timetable is normally to decide within two weeks from the date of receipt of a petition either to accept it for filing or to return it to the petitioner. FDA's timetable calls for ninety days from the date of acceptance of a petition for filing to rendering a decision. If ninety days are insufficient, FDA has the option of extending the examination period an additional 90 days. When FDA requires additional information from a petitioner, this information at the option of FDA can be considered an

amendment to the petition. In such cases the countdown can either be suspended until the additional information is received or it reverts back to day number 1 on the 90 or 180 day cycle. The newly appointed commissioner of FDA has publicly stated in response to a question concerning alterations in procedures to evaluate petitions or in enforcement activities that he is studying this matter and expects "to speed up action, and will take whatever measures are required to achieve this" (17).

Since evaluation of petitions often requires study by individuals in the several fields of science, action could become bogged down as the petition passes from group to group and office to office. It is suggested that regulating agencies consider the project manager system which has worked so well in the Department of Defense and assign a project officer for each petition. It would be the responsibility of the project officer to see that the petition is evaluated and a regulation issued at the earliest date following its receipt.

There is much that the petitioner can do to assist in streamlining and shortening the petition process.

First, the petitioner has an obligation to keep the regulating bodies informed of the status of his research. The ability of a regulating body dealing with the new field of preserving foods by ionizing energy to perform its statutory duties is influenced by the knowledge it has in this field. Since the regulating agency does not generally conduct extensive research in the area it must regulate, it depends upon and learns from the research findings of potential petitioners. It behoves petitioners in their own self-interest to keep open the channels of communication with officials of governmental regulating bodies, invite them to participate in meetings, conferences, and symposia, give them the opportunity to taste-test candidate foods for clearances, keep them abreast of research timetables and anticipated dates to submit petitions, and make them aware of both progress and temporary setbacks. By such actions the prospective petitioner can understand the requirements as well as the thinking of the officials of regulating agencies and can respond intelligently.

Secondly, the petitioner should apprise regulating officials of major findings and other data as they unfold. These actions alert the regulating agencies and condition them to respond favorably and more rapidly when petitions are officially submitted. Often a number of diverse groups, based upon varying scientific disciplines required to evaluate data in a petition, are involved in passing on a petition. Their reaction times will be reduced to the extent they are brought abreast of the most recent significant findings. It is incumbent upon the petitioner to take the initiative in preparing and seeking advice and informal concurrence of officials of regulating agencies a priori in proposed protocols for major time consuming and costly experiments. It is certainly recommended that he prepare drafts of his proposed protocols and discuss them with the very officials who will later pass judgment on his petition. We have found this to be one of the most important facets in planning ahead in areas requiring major research.

In the process of coordinating research protocols with officials of regulating agencies and keeping them informed, the petitioner should use discretion lest he burden these officials unnecessarily. He should use good judgment to avoid consuming the time of these officials with the less important aspects of his problems. He should refrain from making

repetitive requests to reconsider, review, or reopen matters (such as proposed research protocols) which have previously been decided.

Most important of all the duties and obligations of the petitioner is to earn the confidence of regulating agencies in his scientific competency and integrity. In this new method for food preservation, the petitioner may be much more knowledgeable about the application of ionizing energy than those who will sit in judgment. If the petitioner has earned the confidence of members of regulating bodies, they will be more receptive to his requests, proposals and to the ultimate petition. There is no substitute for competency and integrity on the part of the petitioner!! There is no better way to get a petition approved faster than to have the work done by the most competent and honorable investigators.

There is a final recommendation I can make to this international audience -- that the IAEA/FAO serve as a clearing house for all petitions approved by regulating bodies of any nation. This would involve a massive job in reproduction for members of the United Nations. I believe, however, that the benefits to all mankind far transcend the burden I would like to see IAEA/FAO assume. By bringing to the attention of the scientific community all the information contained in these petitions, much time and money can be saved and needless duplication in research can be minimized, thus materially shortening the lead time and streamlining the entire petitioning process.

The salient points can be summarized as follows:

1. The scientific feasibility of the process to preserve foods with ionizing energy has been demonstrated.

2. To establish this process on a commercial basis will require approvals by governmental regulatory bodies of petitions, supported by adequate evidence, requesting exemptions to legal prohibitions where they may exist to the use of ionizing energy to preserve foods.

3. For countries which are considering enacting statutes for the control of irradiation of food and food products for human consumption, it is recommended that authority to administer these statutes be vested in a single agency.

4. The time-consuming expensive process of data collecting, writing, and evaluating petitions can be streamlined and expedited if the regulatory agency:

a. Establishes clearly in advance reasonable requirements for the breadth and depth of the required scientific evidence.

b. Adopts a flexible attitude as circumstances change, yet not arbitrarily change requirements or impose new ones in midstream.

c. Is willing, upon request, to advise the petitioner during the course of data gathering.

d. Is willing, upon request, to assist the petitioner in preparation of the petition.

e. Establishes and adheres to a finite timetable for passing on petitions and issuing regulations.

f. Considers using the project officer system or similar procedure to expedite handling of petitions from time of receipt to issuance of regulations.

g. Considers granting approvals for groups of foods, food products, and packaging materials once experience has been gained from initial approvals on an individual basis.

h. Places minimal requirements for further animal feeding studies in light of the overwhelming evidence from the U. S. Army's and AEC's studies indicating that irradiated foods are wholesome at doses up to 5.6 Mrads and at electron energies below 10 MeV.

5. The petitioner can simplify the petition process if he:

a. Keeps the regulatory agency informed of the status of his research.

b. Apprises the regulatory agency of major research findings and other evidence as they unfold.

c. Prepares and seeks advice and concurrence of the regulatory agency a priori in proposed protocols involving major time-consuming and costly experiments.

d. Refrains from unnecessarily overburdening officials of regulating agencies with the less important aspects of his problems and with repetitive requests to reconsider, review, or reopen matters previously decided.

e. Earns the confidence of the regulatory agency in his scientific competency and integrity.

6. To expedite the flow of information among member countries, avoid duplication of effort, and simplify and shorten the petition cycle, it is recommended that the IAEA/FAO of the United Nations serve as a clearing house for all petitions approved by regulatory bodies of any nation and accompanying implementing regulations.

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DISCUSSION

J. VERGRAGT: I should like to suggest that a deputy project officer be appointed to assist the project officer assigned for each petition.

E.S. JOSEPHSON: Thank you for your suggestion. I agree that it would be helpful for the project officer to be assisted by an assistant or deputy, who would be responsible for the processing of the petition in the absence of his superior. I shall pass this suggestion on to the regulatory bodies in the United States.

A. LAFONTAINE: I feel that the World Health Organization as well as the International Atomic Energy Agency and the Food and Agriculture Organization of the United Nations should take part in a world-wide survey of the incidence of Clostridium botulinum.

E.S. JOSEPHSON: Yes indeed; WHO could also assist the task group of the National Academy of Sciences-National Research Council in formulating recommendations for microbiological standards of safety for radappertized foods.